

Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/US2004/042114

International filing date: 16 December 2004 (16.12.2004)

Document type: Certified copy of priority document

Document details: Country/Office: US
Number: 60/529,832
Filing date: 16 December 2003 (16.12.2003)

Date of receipt at the International Bureau: 11 June 2007 (11.06.2007)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)



World Intellectual Property Organization (WIPO) - Geneva, Switzerland
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse

1620034

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

June 05, 2007

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE.

APPLICATION NUMBER: 60/529,832

FILING DATE: *December 16, 2003*

RELATED PCT APPLICATION NUMBER: *PCT/US04/42114*

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS *US60/529,832*



Certified by

Under Secretary of Commerce
for Intellectual Property
and Director of the United States
Patent and Trademark Office

18379 U.S. PTO
121603

Please type a plus sign (+) inside this box 

PTO/SB/16 (8-00)
Approved for use through 10/31/2002. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

INVENTOR(S)					
Given Name (first and middle [if any])		Family Name or Surname		Residence (City and either State or Foreign Country)	
Voytek		Wilczak		109-41 East Shearwater Court, Jersey City, NJ 07305	
<input type="checkbox"/> Additional inventors are being named on the _____ separately numbered sheets attached hereto					
TITLE OF THE INVENTION (280 characters max)					
Grafting Acrylate Groups to Organic Substrates Using Plasma Atmospheric Pressure Glow Discharge (APDG)					
Direct all correspondence to: CORRESPONDENCE ADDRESS					
<input type="checkbox"/> Customer Number		25900		<div>Place Customer Number Bar Code Label here</div>	
OR Type Customer Number here					
<input checked="" type="checkbox"/> Firm or Individual Name		Sun Chemical Corporation			
Address		222 Bridge Plaza South			
Address					
City		Fort Lee	State	NJ	ZIP 07024
Country		USA	Telephone	201-224-4600	Fax 201-224-2439
ENCLOSED APPLICATION PARTS (check all that apply)					
<input checked="" type="checkbox"/> Specification		Number of Pages		3	
<input type="checkbox"/> Drawing(s)		Number of Sheets		<input type="checkbox"/> CD(s), Number	
<input type="checkbox"/> Application Data Sheet. See 37 CFR 1.76				<input type="checkbox"/> Other (specify)	
METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT (check one)					
<input type="checkbox"/> A check or money order is enclosed to cover the filing fees				FILING FEE AMOUNT (\$)	
<input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number		19-4968		\$160.00	
<input type="checkbox"/> Payment by credit card. Form PTO-2038 is attached.					
The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.					
<input checked="" type="checkbox"/> No.					
<input type="checkbox"/> Yes, the name of the U.S. Government agency and the Government contract number are: _____					

Respectfully submitted,

SIGNATURE



TYPED or PRINTED NAME

Sidney Persley

TELEPHONE

201-224-4600 Ext. 278

Date

12/16/03

REGISTRATION NO.

34,898

(if appropriate)

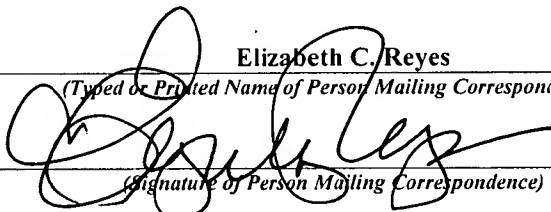
Docket Number:

C-605

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

This collection of information is required by 37 CFR 1.51. The information is used by the public to file (and by the PTO to process) a provisional application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the complete provisional application to the PTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, Washington, D.C. 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Box Provisional Application, Assistant Commissioner for Patents, Washington, D.C.

P19LARGE/REV05

CERTIFICATE OF MAILING BY "EXPRESS MAIL" (37 CFR 1.10) Applicant(s): Voytek Wilczak			Docket No. C-605
Serial No.	Filing Date	Examiner	Group Art Unit
Invention: Grafting Acrylate Groups to Organic Substrates Using Plasma Atmospheric Pressure Glow Discharge (APDG)			
<p>I hereby certify that this <u>Provisional Patent Application</u> <i>(Identify type of correspondence)</i></p> <p>is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 in an envelope addressed to: The Commissioner of Patents and Trademarks, Washington, D.C. 20231-0001 on <u>December 16, 2003</u> <i>(Date)</i></p> <div style="text-align: center;"><p><u>Elizabeth C. Reyes</u> <i>(Typed or Printed Name of Person Mailing Correspondence)</i></p><p> <i>(Signature of Person Mailing Correspondence)</i></p><p><u>EL615311822US</u> <i>("Express Mail" Mailing Label Number)</i></p></div>			
<p>Note: Each paper must have its own certificate of mailing.</p>			

INVENTION RECORD

Sun Chemical Corporation

RECEIVED

NOV 21 2003

SIDNEY F. CHOLLET

Inventor(s) Voytek Wilczak		Case # C-605	Origin
Descriptive Title Grafting Acrylate Groups to Organic Substrates using Plasma Atmospheric Pressure Glow Discharge (APDG)			
Status of Invention		Applying atomized monofunctional acrylates into the plasma field and depositing them onto moving webs as thin coatings is not new. However, the goal to date was to crosslink all acrylate groups and thus obtain a crosslinked acrylic thin film for such properties as adhesion promotion, water repellency, or water acceptance. The idea is novel because I am proposing to use multi-functional acrylates and ON PURPOSE leave some acrylate groups UNCROSSLINKED in the deposited film, leaving them available for reaction with EC coatings and inks (not adhesives – see prior art below).	
Conception Date Oct 27, 2003			
1 st Written Description Date: Oct 28, 2003	Where Recorded: Sun E-mail (attached)	Date Prepared: 11/18/03	Date Received: 11-21-03
			Rating:

BACKGROUND OF INVENTION:

This invention involves using Atmospheric Pressure Glow Discharge (APDG) to attach unpolymerized acrylate groups to organic substrates, such as moving plastic webs. The technique involves introducing a liquid precursor (a multi-functional acrylate) directly into APDG via an ultrasonic nebulizer, and depositing the precursor onto the substrate under such conditions that some acrylate groups remain unpolymerized while some polymerize and get attached to the substrate. The un-polymerized acrylate groups can then be available to react with Energy-Curable inks, coatings, or adhesives, greatly improving adhesion.

PRIOR ART:

WO 00/78469 deals with epoxy based coatings (specifically glycidyl methacrylates and the like) that are plasma deposited and pulse plasma polymerized to form a coating film. They can be further derivatized by using acids, amines, etc. Their use as an adhesive (laminating?) is also detailed. The polymerization usually occurs with the deposition, but there are reactive groups (epoxies) that are left unreacted.

Our biggest obstacle will be Claim 13 which reads: A method for adhering two surfaces together, said method comprising applying a reactive coating to at least one of said surfaces by plasma deposition, and contacting said surface with the other surface under conditions whereby reactive groups in the coating will react so as to secure the two surfaces together.

Since they simply state under conditions without giving details, use of EB to achieve the crosslinking will fall under this claim if we use epoxy based monomers, or possibly any reactive species since in this particular claim they do not distinguish what reactive coating they are using. However, in all of the other claims and spec they are using epoxy based monomers. **This may preclude our use of this for laminating applications.**

WO 02/28548 is a Dow Corning patent that covers the use of the technology of using plasma to coat a substrate.

The broad Claim 1 reads: A method for forming a coating on a substrate, which method comprises introducing an atomized and/or solid coating forming material into an atmospheric pressure plasma discharge and/or ionizing gas stream resulting there from, and exposing the substrate to the atomized coating-forming material.

This claim would seem to cover using plasma discharge to coat a substrate with reactive materials. They do mention both epoxies and mono-acrylates. They also mention the polymerization is carried out using atmospheric pressure plasma discharge (i.e. it is polymerized when deposited).

Polymerization is essentially complete with deposition. There is no intention of having a second polymerization reaction, other than to post treat with a second plasma discharge (claim 15).

As long as we are using a plasma to coat a substrate with reactive species, we are in danger of infringing on claim 1 above. We could license the technology, or try to differentiate our method from theirs. In our method, we would prefer to leave as much unreacted by the plasma as possible, since we will finish the reaction with EB. In their method, they essentially want complete polymerization.

We could probably use the method to pre-coat a film with an adhesion promoter and print over it.

Maybe a claim like: A method of producing a cured coating or ink on a substrate comprising:

- A) coating a substrate with coating forming (adhesion promoting) ethylenically unsaturated material using a plasma discharge and/or ionized gas stream such that the coating forming material is only partially polymerized and retains ethylenically unsaturated moieties at the end of the plasma treatment
- B) adding a second or more layer of an energy-curable coating material (or ink) using conventional means
- C) curing (or polymerizing) the coating with actinic radiation to produce a dry film.

The key to our using this technology is that we do not want to polymerize all the species in the plasma deposition. We want to cure with EB at a later stage. We could also use low energy plasma to deposit and not totally polymerize the coating. At the very least, we are offering an improvement on their method as plasma polymerization usually produces very highly crosslinked polymers that lack a regular repeat unit. We would produce polymers with a much more consistent structure and different final properties.

In summary, Dow has a fairly strong position using this technology. We could probably use the technology as a means of applying an adhesion promoting agent, and we may be able to use the technology if we are able to show that we polymerize the reactive species to a lesser degree with the intention of curing it later with a second type of energy.

Other relevant patents are: 6,548,121 (grafting of photoinitiators to film surface), 6,551,950 (grafting of halo-organic compounds to surfaces using plasma), US Patent Application 20020114954 (bonding fluoropolymer films to substrate), US Patent Application 20030104140 (depositing organosilicons onto substrates).

SUMMARY OF INVENTION:

Instant invention describes a process of atomizing a liquid, multifunctional acrylate monomer (such as TMPTA) and injecting it directly into Atmospheric Pressure Glow Discharge (APDG). APDG is described, for example, in WO 02/28548, assigned to Dow Corning. But in the prior art the desired outcome of injecting monofunctional acrylates into APDG, often bearing other functional groups such as fluoro, epoxy, etc, was to fully polymerize the acrylate groups, thus anchoring the functional polymer to the substrate. Such polymer would then serve as an adhesion promoter or water repellant. In the instant invention, the APDG conditions are selected in such a manner that some acrylate groups of the multi-functional acrylate are crosslinked in the plasma, but some remain un-polymerized, serving as excellent covalent anchors to Energy-Curable inks and coatings.

ADVANTAGES OVER PRIOR ART:

Prior art sought to polymerize all acrylate groups, thus making creation of covalent acrylate-acrylate bonds between the substrate and ink or coating impossible. The instant invention allows for formation of such bonds instantaneously when the ink or the coating is energy-cured.

DESCRIPTION OF INVENTION:

Main Claims (example):

A method of producing a cured coating or ink on a substrate comprising:

- A) coating a substrate with coating forming (adhesion promoting) ethylenically unsaturated material using a plasma discharge and/or ionized gas stream such that the coating forming material is only partially polymerized and retains ethylenically unsaturated moieties when deposited on the substrate
- B) adding a second or more layer of an energy-curable coating material (or ink) using non-plasma means
- C) curing (or polymerizing) the coating (or ink) with actinic radiation to produce a dry film.